

Docket No. 2003-010**Remarks**

In response to the final Office Action mailed September 21, 2005, applicant requests continued examination of the application under the provisions of 37 CFR 1.114. Claims 1-25 and 29-35 are pending in the application. Please cancel claims 5, 18, 24, 29 and 34. Please amend claims 1-4, 6-7, 9-10, 16, 19-23, 25, 30-33 and 35. No new matter has been added.

Claim 4 is objected to. Claim 4 now starts on a new line.

All the claims are rejected under 35 USC 112 second paragraph as being indefinite. However, claims 10-17, 25 and 35 are so rejected only because they depend from a rejected base claim. In addition, claims 10-17, 25 and 35 are indicated as being allowable if rewritten in independent form. Although applicant does not believe the 112 rejections are proper, to further prosecution of the application, applicant has rewritten claims 10, 25 and 35 in independent form. Therefore, claims 10, 25 and 35 are allowable. Claims 11-17 depend directly or indirectly from claim 10 and are allowable. Claims 19-23 depend directly or indirectly from claim 25 and are allowable. Claims 30-33 depend directly or indirectly from claim 35 and are allowable.

The remaining claims are 1-4 and 6-9. These claims are rejected under 35 USC 112 second paragraph as being incomplete for omitting essential structural cooperative relationships of elements. These rejections are respectfully traversed. Claim 1 recites a firetrain for a safe and arm device. The firetrain is an element or component of the safe and arm device. Patents are routinely granted for components of devices. For example, an automobile tire is a component of an automobile. Even though the automobile is critical to realize the function of the tire, a patent claim directed to only the tire is proper and need not include structural limitations that define a connection to the automobile. Even though the tire (or in this case the firetrain) "could be interpreted as floating in space or lying about on a table", as the examiner states, such an interpretation does not mean the claim is incomplete under 35 USC 112. Thus, the rejections of claims 1-4 and 6-9 under 35 USC 112 should be withdrawn.

Claims 1-4 and 6-9 are rejected under 35 USC 103 as being unpatentable over US 6167809 to Robinson et al. (Robinson). Applicant agrees that Robinson describes a fire train comprising out of alignment explosives wherein in the safe position the transfer charge is remote

Docket No. 2003-010

from the other explosives and in the armed position the transfer charge is adjacent the other explosives. However, Robinson does not disclose the patentable novelty of claim 1 which is that the input explosive column and the receptor charge are **not collinear**. In prior firetrains, the moveable transfer charge, in the armed position, connected an input column and an output column (or receptor charge) that were collinear. The advantage of the arrangement of claim 1 is an increase in safety, as shown in Fig. 1, for example.

Fig. 1 shows the input explosive column 22, the transfer charge 23 and the receptor charge 24. As plainly shown in Fig. 1 and as claimed in claim 1, the input column 22 and the receptor charge 24 are never lined up (collinear), whether the transfer charge 23 is in the armed or unarmed position. In the unarmed position of the transfer charge 23, the invention of claim 1 is safer than prior fire trains because a premature firing of the input column 22 discharges downward and away from the receptor charge 24. In contrast, in prior inline fire trains, a premature firing of the input column discharges directly inline with the output column or receptor charge 24. Of course, in the prior art, there is a gap between the collinear input and output columns. But the chance of the explosive discharge from the input column bridging a straight line gap is much greater than the chance of the explosive discharge from the input column bridging a straight line gap and a transverse gap, as would be required in claim 1.

The examiner admits that Robinson does not disclose the arrangement of claim 1 but concludes that it would be obvious to arrange the firetrain as in claim 1 because rearranging parts of an invention involves only routine skill in the art, In re Japiske, 86 USPQ 70. While the holding in In re Japiske may be good for its particular facts, it simply does not apply to claim 1, wherein a **novel** arrangement of the explosive elements of a firetrain results in an **advantage** not found in the prior art. Thus, claim 1 is patentable over Robinson. Claims 2-4 and 6-9 depend directly or indirectly from claim 1 and are, therefore, also allowable.

Dependent claim 2 recites additional novel and unobvious features. As amended, claim 2 includes the subject matter of original claims 2 and 5. The transfer charge 23 comprises CL-20 with a binder, which is a secondary explosive (original claim 5). The use of the particular secondary explosive CL-20 with a binder is disclosed in the specification at page 1, line 21. The

Docket No. 2003-010

"less than" volume of the transfer charge, 0.0002 cubic centimeters, is obtained from original claims 2-4 and subtraction.

Applicant's work with MEMS type firetrains and safety and arming devices has involved, among other tasks, the problem of miniaturizing the components while maintaining acceptable operation. Miniaturization has many benefits in a munition or projectile. A primary benefit is the increased space and weight available for the payload when the non-payload components are made smaller and lighter. As one decreases the size of the components, several problems arise. First, the mechanical components (i.e., the arming slider) become so small that the amount of mass (i.e., the transfer charge) they can move is limited. Second, the explosive output of small amounts of energetic material may be too little to ignite the next element of the fire train.

Applicant has discovered that by using the secondary explosive CL-20 with a binder as the movable transfer charge, the volume of the transfer charge may be less than 0.0002 cubic centimeters. This small volume is movable by a MEMS scale mechanism and, surprisingly, possesses enough explosive output to detonate the next element of the firetrain. An added advantage is that the secondary explosive CL-20 with a binder is less sensitive than primary explosives, which have typically been used as the movable charge.

The examiner admits that Robinson does not disclose the claimed volumes but concludes that it would be an obvious matter of design choice to select volumes as necessary because a change in size is generally recognized as being within the level of ordinary skill in the art, In re Rose, 105 USPQ 237 (CCPA 1955). Also, the examiner admits that Robinson does not disclose the claimed type of explosives but concludes that it is an obvious design choice, In re Leshin, 125 USPQ 416. Once again, the holdings in In re Rose and In re Leshin are no doubt applicable to their particular facts. However, these holdings do not apply to the present invention, where such an extremely small volume of an explosive has never been used because it was thought to be nonfunctional, and the particular type of explosive chosen provides the functionality needed.

Applicant is aware of no teaching that instructs one to produce an operable firetrain of any size by simply magnifying or reducing the size of a complete known firetrain. Indeed, to those of skill in the art of firetrains and explosives, such a proposition is not only unheard of, but

Docket No. 2003-010

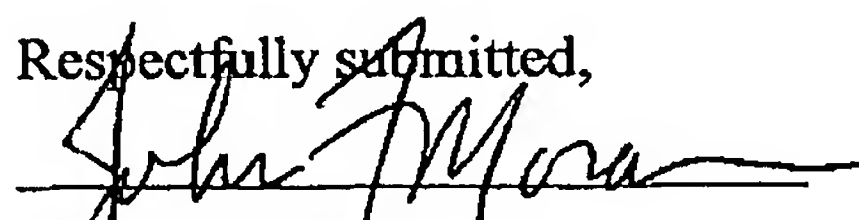
dangerous. Thus, claim 2 recites a novel and unobvious composition and volume for a transfer charge.

In view of the foregoing, reconsideration and allowance of pending claims 1-4, 6-9, 10-17, 19-23, 25, 30-33 and 35 is earnestly solicited so that the case may pass to issue.

20 December 2005

DATE

Respectfully submitted,



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For: MICRO-SCALE FIRETRAIN FOR ULTRA-MINIATURE

ELECTRO-MECHANICAL SAFETY AND ARMING DEVICE

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